OFFICIAL PUBLICATIONS
OF CORNELL UNIVERSITY

VOLUME V NUMBER 15

NEW YORK STATE COLLEGE OF AGRICULTURE

ANNOUNCEMENT OF THE DEPARTMENT OF FORESTRY 1914-15

AUGUST 1, 1914
PUBLISHED BY CORNELL UNIVERSITY
ITHACA, NEW YORK

CALENDAR

First Term, 1914–15

Sept.	11,	Friday,	University entrance examinations begin.
Sept.	21,	Monday,	Academic year begins. Registration of new students. All special students in the College of Agriculture must first present themselves at the office of the Secretary, Roberts Hall 122, unless permission to register has previously been sent to them by the Registrar.
Sept.	22,	Tuesday,	Registration of new students.
Sept.	23,	Wednesday,	Registration of old students.
Sept.	24,	Thursday,	Instruction begins. President's annual address to the students.
Sept.	26,	Saturday,	Registration, graduate students.
Oct.	13,	Tuesday,	Last day for payment of tuition.
Nov.	10,	Tuesday,	Registration of winter-course students.
Nov.		Thursday–Friday,	Thanksgiving recess.
Dec.	19,	Friday,	Instruction ends in winter courses.
Dec.	22,	Tuesday,	Instruction ends in regular courses. Christmas recess.
Dec.	29,	Tuesday,	Instruction resumed in winter courses.
Jan.	5,	Tuesday,	Instruction resumed in regular and special courses.
Jan.	11,	Monday,	Founder's Day.
Jan.	25,	Monday,	Term examinations begin.

Second Term, 1914–15

Feb.	6,	Saturday,	Registration, undergraduates.
Feb.	8,	Monday,	Instruction begins.
Feb.	12,	(week of)	Farmers' Week.
Feb.	12,	Friday,	Instruction ends in winter courses.
Feb.	26,	Friday,	Last day for payment of tuition.
March	31,	Wednesday,	Instruction ends } Spring recess.
April	8,	Thursday,	Instruction resumed }
May	22,	Saturday,	Navy Day.
June	2,	Wednesday,	Term examinations begin.
June	16,	Wednesday,	Forty-sixth Annual Commencement.

Third Term, 1914–15

June	7,	Monday,	Registration.
June	8,	Tuesday,	Instruction begins.
Sept.	22,	Wednesday,	Term ends.

Summer School in Agriculture, 1915

July	5,	Monday,	Summer School begins.
Aug.	13,	Friday,	Summer School ends.

First Term, 1915–16

Sept	17,	Friday,	Entrance examinations begin.
Sept.	27–28,	Monday–Tuesday,	Registration of new students.
Sept.	29,	Wednesday,	Registration of old students.
Sept.	30,	Thursday,	Instruction begins.

THE DEPARTMENT OF FORESTRY

OFFICERS AND STAFF

Jacob Gould Schurman, A.M., D.Sc., LL.D., President of the University.
James Edwin Creighton, Ph.D., LL.D., Dean of the Graduate School.
David Fletcher Hoy, M.S., Registrar of the University.
Beverly Thomas Galloway, B.Agr. Sc., LL.D., Director of the College of Agriculture and Dean of the Faculty.
Albert Russell Mann, B.S.A., Secretary to the College of Agriculture.
Ralph Sheldon Hosmer, B.A.S., M.F., Professor of Forestry.
Samuel Newton Spring, B.A., M.F., Professor of Forestry.
Arthur Bernhard Recknagel, B.A., M.F., Professor of Forestry.
Frank B. Moody, A.B., M.S.F., Extension Professor of Forestry.
John Bentley, jr., B.S., M.F., Assistant Professor of Forestry.

Students in the Department of Forestry receive instruction also from a corps of professors and instructors in the Colleges of Agriculture, Arts and Sciences, and Civil Engineering.

THE DEPARTMENT OF FORESTRY

The Department of Forestry is a department of the New York State College of Agriculture, a college of Cornell University.

The Department has three principal aims: to give instruction at the University; to conduct research; and to give direct help to the owners of forest lands in New York State.

The instruction in forestry is designed to meet the needs of several classes of students: (1) students of general agriculture who wish elementary instruction in the care of woodlands and in forest planting and forest nursery work; (2) prospective teachers, business men, lawyers, and others who desire an understanding of the place of forestry in the life of a nation; (3) technical students in other lines who wish one or more technical forestry courses, such as wood technology; (4) professional forestry students.

An important part of the work of the Department is its effort to be of direct help to owners of forest lands in New York State. This is accomplished by correspondence, publications, lectures, personal inspection of woodland or of land to be planted, and cooperative care of forest lands.

GENERAL INSTRUCTION IN FORESTRY

For students who wish general instruction in forestry but do not wish to take the professional course in forestry, courses 1, 2, 3, and 6 (see page 10) are recommended. The other courses in the Department, except course 18, are also open to such students if they have the necessary prerequisites.

PROFESSIONAL COURSE IN FORESTRY

Aims

The professional forestry course is designed to prepare students for a professional career in general forestry, and also to provide opportunity for advanced study and research in silviculture, forest management, forest mensuration, forest entomology, forest pathology, and other lines in which specialists will be useful.

Degrees and Length of Course

Adequate preparation for the profession of forestry requires at least a year of graduate study in addition to the four year undergraduate course. The undergraduate work in forestry leads to the degree of Bachelor of Science; the graduate work leads to that of Master in Forestry. Students who enter as graduates without having had undergraduate instruction in forestry should be able to complete the work for the master's degree in two years if they have had substantially the equivalent of most of the courses, other than forestry, listed in the sequence of courses on pages 7–8; if they lack much of the fundamental science work there listed, a correspondingly longer time will be required for such students to qualify for the master's degree. Work for the degree of Doctor of Philosophy may also be done in forestry.

Admission and Classification

The following classes of students are admitted to the work of the Department of Forestry of the New York State College of Agriculture:

1. Persons who desire to begin, as freshmen, the regular undergraduate course leading to the degree of Bachelor of Science.

2. Persons who have already attended some college or university and desire to enter with advanced standing.

For the admission of graduate students see page 6.

1. **Admission to Freshman Class.** An undergraduate student registers in the College of Agriculture and is a candidate for the degree of Bachelor of Science. An applicant for admission as a freshman to the Department of Forestry of the New York State College of Agriculture must offer fifteen units arranged as follows: English (3), history (1), elementary algebra (1), plane geometry (1), a foreign language (3), elective (6).

It is strongly recommended that, when possible, prospective students shall include solid geometry and plane trigonometry among the elective subjects offered for admission.

The required and the elective subjects that may be offered for admission are named in the following list; the figure in parenthesis following each subject indicates its value in units and shows the maximum and the minimum amount of credit allowed in the subject. A unit represents five prepared recitations a week for one year in a study.

1a. English A	(2)	8a. Ancient History	(½–1)
1b. English B	(1)	8b. Modern History	(½–1)
2a. First Year Greek	(1)	8c. Am. History and Civics	(½–1)
2b. Second Year Greek	(1)	8d. English History	(½–1)
2c. Third Year Greek	(1)	9a. Elementary Algebra	(1)
3a. First Year Latin	(1)	9b. Intermediate Algebra	(½)

3b.	Second Year Latin	(1)	9c.	Advanced Algebra	(½)
3c.	Third Year Latin	(1)	9d.	Plane Geometry	(1)
3d.	Fourth Year Latin	(1)	9e.	Solid Geometry	(½)
4a.	First Year German	(1)	9f.	Plane Trigonometry	(½)
4b.	Second Year German	(1)	9g.	Spher. Trigonometry	(½)
4c.	Third Year German	(1)	10.	Physics	(1)
5a.	First Year French	(1)	11.	Chemistry	(1)
5b.	Second Year French	(1)	12.	Physical Geography	(½–1)
5c.	Third Year French	(1)	13.	Biology*	(1)
6a.	First Year Spanish	(1)	14.	Botany*	(½–1)
6b.	Second Year Spanish	(1)	15.	Zoology*	(½–1)
6c.	Third Year Spanish	(1)	16.	Agriculture †	(½–4)
7a.	First Year Italian	(1)	17.	Drawing	(½–1)
7b.	Second Year Italian	(1)	18.	Manual Training	(1)
7c.	Third Year Italian	(1)	19.	Any high school subject or subjects not already used	(½–1)

Students are admitted on examination, or on presenting credentials of the University of the State of New York, or on acceptable school certificates.

Candidates for admission must file their credentials and obtain permits for examination at the University Registrar's Office, Morrill 10. Results of examinations may be ascertained from the Registrar.

For other details as to subjects and methods of admission, see the General Circular of Information, which may be obtained on application to the Secretary, Cornell University, Ithaca, New York.

2. **Admission to Advanced Standing.** A student who, having already attended some college or university, desires advanced undergraduate standing, should file with the Registrar of Cornell University, on an official blank to be obtained from him, a formal application for admission to advanced standing in the College of Agriculture, together with an official certificate, from the college or university already attended, of his honorable dismissal, his entrance examinations in detail, his terms of attendance, and the amount of work that he has completed, and a detailed statement of the courses pursued for which he desires credit at Cornell. He should send also a catalogue of the institution, writing on it his name and marking the entrance requirements that he has satisfied and each subject that he has completed.

A student admitted to the College of Agriculture from another college in Cornell University, or from any other institution of collegiate rank, will be regarded as having completed the number of terms and hours to which his records entitle him, and will receive all the privileges of students who have completed the same number of terms and hours by residence in the College. In order, however, to obtain the degree of Bachelor of Science, he must have completed the subjects listed in black-faced type in the recommended sequence of studies on pages 7–8, and all but twenty hours of his elective work must have been taken in courses allowed as agricultural electives. He must also have been in residence in the College of Agriculture for at least two consecutive terms and have completed not less than fifteen hours a term, of which two-thirds, at least, must be subjects taught by the staff of the College of Agriculture. He will not be required to take all the subjects not in black-faced type on pages 7–8; the Department of Forestry will arrange his course of study to suit his needs.

*If an applicant has counted Biology (1) he may not offer also Botany (½) or Zoology (½).

†An applicant may offer not to exceed four units in vocational subjects under numbers 16, 18, and 19 combined.

3. **Admission as a Graduate Student, Candidate for the Degree of Master in Forestry.** A graduate student registers in the Graduate School as a candidate for the degree of Master in Forestry, if the following requirements have been fulfilled:

(1) The candidate's training must be accepted as substantially equivalent to the first four years of the professional forestry course given at Cornell University (see pages 7–8).

(2) The candidate must have had at least three months experience in forestry work or in a logging camp, proof of which is to be by a signed statement or an examination in woodmanship, or by both.

A student entering the Graduate School as a candidate for the degree of Master in Forestry should not enter at the beginning of the second term. It will be impossible to arrange his work unless he enters at the beginning of the first term.

4. **Admission as a Graduate Student, not a Candidate for a Degree.** A student who is a graduate of an institution in which the amount of work required is substantially equivalent to that required for the first degree in one of the four year courses at Cornell University, but who cannot meet the technical requirements listed under 3, may register in the Graduate School, but not as a candidate for a degree. Such a student may, if he prefers, register in the College of Agriculture as a candidate for the degree of Bachelor of Science. In either case, as soon as the requirements listed under 3 are fulfilled, the student registers in the Graduate School as a candidate for the degree of Master in Forestry.

REQUIREMENTS FOR DEGREES

Undergraduate Work Leading to the Degree of Bachelor of Science

The requirements for the degree of Bachelor of Science are residence for eight terms, and, in addition to the prescribed work in the Department of Physical Culture and Military Science and Tactics, the completion of one hundred and twenty hours of required and elective work. The required and elective work must include all the courses listed in black-faced type in the sequence of studies given below, and such other courses as the Department of Forestry believes to be best adapted to meet the needs of the individual student, subject to the regulations of the College of Agriculture. The sequence of studies given below is recommended and will prove desirable for most students. It is to be understood, however, that this is not a curriculum required of all students. Deviations from it will be made for students entering the course with advanced standing, and for other students whenever advisable. In choosing the subjects to be elected, each forestry student must obtain the advice and approval of a professor or an assistant professor in the Department of Forestry, who shall be chosen by the student at the beginning of the sophomore year. Admission to candidacy for the degree of Master in Forestry may be conditioned on compliance with this regulation. Freshmen who are planning to take the professional forestry course are urged to call at the office of the Department of Forestry at the beginning of the college year.

Graduate Work Leading to the Degree of Master in Forestry

As candidate for the degree of Master in Forestry, the student selects one major and one minor subject and pursues either advanced study or research along those lines. Graduate students do not devote this year to undergraduate class work, although in special cases a part of the student's time may be spent in such work. The work of each candidate for an advanced degree is in charge of a committee consisting of two or more professors under whom his major and minor subjects are pursued, the professor of his major subject being the chairman. A candidate for the master's degree must spend at least one year in residence at this University. He must present a satisfactory thesis, or essay, and must pass an examination.

The work of students who enter as graduates but are not yet candidates for the master's degree, will be arranged to suit the needs of each student.

Attention is called to the fact that under the direction of professors of entomology and plant pathology, facilities are offered for advanced study of forest insects and tree diseases. Details regarding advanced work along these and other allied lines are to be found in the Announcement of the Graduate School.

Graduate Work Leading to the Degree of Doctor of Philosophy

Candidates for the degree of Doctor of Philosophy may elect either major or minor subjects in forestry. Details regarding work for the doctorate may be obtained on application to the Dean of the Graduate School.

RECOMMENDED SEQUENCE OF STUDIES FOR PROFESSIONAL FORESTRY STUDENTS

The subjects in black-faced type are required of all students in the College of Agriculture. The subjects given in the freshman year which are not in black-faced type must be taken by all freshmen who plan to take the professional forestry course; the failure of a student to do this will complicate the remainder of his course.

Freshman year

	Hours 1st term		Hours 2d term
English 1	4	**English 1**	4
Chemistry 1	6	**Chemistry 85**	4
Biology 1	3	**Biology 1**	3
The Farm 1	2	Drawing 1	3
Mathematics 1*	3	Mathematics 3*	2

Sophomore year

	Hours 1st term		Hours 2d term
Botany 1	5	**Physics 2**	5
Geology 1	3	**Botany 20 (General Plant Physiology)**	4
Geology 11	3	Geology 15	1
Civil Engineering 10 (Elementary Surveying)	3	Civil Engineering 11a (Advanced Surveying)	4
Entomology 3	3	Entomology 41	2
		Sibley S4 (Forge Work)	1

*If Mathematics 1 (solid geometry) has been offered for entrance, Mathematics 3 (plane trigonometry) should be taken in the first term, and Meteorology 1 should then be taken in the second term. If not taken in the freshman year, meteorology should be taken later if possible.

Summer following sophomore year

Summer camp for six weeks, beginning in June. Civil Engineering 13 (Surveying), six hours credit.

Junior year

	Hours 1st term		Hours 2d term
Political Science 51	3	**Political Science 51**	3
Forestry 6	2	Forestry 8	2
Zoology 5	3	Plant Pathology 7	2
Plant Pathology 1	3	Zoology 5	3
Botany 2	3	Entomology 51	2
Civil Engineering 14 (Surveying)	2	Soil Technology 1	3

Senior year

Forestry 9	4	Forestry 10	2
Forestry 13	3	Forestry 11	5
Forestry 14	3	Forestry 15	3
Forestry 18	1	Forestry 16	3
Forestry 19	3	Landscape Art 2	1
		Rural Engineering 3	3

The remaining work of the undergraduate years should be chosen with reference to the tastes and needs of the individual student.

Fifth year (first year of graduate study, see page 7)

The lines of work in which the student in his first year of graduate study will be engaged are: forest management (Forestry 20); forest administration (Forestry 21); seminary (Forestry 22); and either advanced work (Forestry 23) or research (Forestry 24). During the six or eight weeks preceding Commencement, students taking course 23, except those who are specializing in lines not requiring a field trip, will be engaged in working-plan and other forestry work on a large forest tract in New York or Pennsylvania.

EQUIPMENT

The Department of Forestry occupies two and one-half floors in the Forestry Building, which was recently built by the State at a cost of $120,000. The building is one hundred and forty-two feet long and fifty-four feet wide, and four stories in height. One floor and one half of another floor are being occupied temporarily by the Department of Plant Breeding, but the entire building is planned for the Department of Forestry and is to be used exclusively by that Department as soon as a Plant Industry Building is provided. The building is thoroughly equipped and affords ample opportunities for undergraduate instruction and for advanced study.

The Department has a tract of about one hundred and seventy-five acres of open land which is being used for forest planting; another tract of thirty-eight acres, partly open land and partly wooded; and eight woodlots, including stands of white pine, hardwoods, and hemlock. All these lands are within three miles of the university campus. The Department has planted more than seventy acres of its land with experimental and demonstrational plantations. There is also a forest nursery.

A forestry library of more than fourteen hundred bound volumes, including files of forestry periodicals, is included in the University Library. The Department has an excellent collection of forestry instruments.

EXPENSES

Tuition for Undergraduate Students. Tuition in the College of Agriculture is free to both graduate and undergraduate students who for a year or more immediately preceding admission have been residents of the State of New York. The annual tuition fee for both regular and special students from outside the State is $125.

Tuition of Graduate Students. Tuition is free to graduate students for work in the New York State College of Agriculture. For Graduate School minor subjects taken outside the College of Agriculture, pro rata tuition (one-sixth for each minor) of the college in which the minors are taken will be charged. For Graduate School minors taken in the College of Agriculture by students whose major subject is in another college, pro rata tuition (one-sixth for each minor) will be deducted. For Graduate School students not candidates for a degree, tuition will be pro rata as of the college or colleges in which the work is taken.

A graduate student, candidate for the degree of Master in Forestry, will have no minors outside the College of Agriculture.

Other Fees and Expenses. Other fees are as follows: matriculation fee, paid when entering the University, $5; fee for baccalaureate degree, $10; fee for advanced degree, $20; infirmary fee, $3 a term. Laboratory fees are required in various courses. The fee for the summer camp in surveying is $35, which includes board and lodging for six weeks. The expense for textbooks, instruments, and the like, varies from $10 to $75 a year. The cost of living in Ithaca, including board, room, heat, and light, varies from $5.50 to $10 a week.

CORRESPONDENCE

Correspondence regarding entrance as a freshman and admission to advanced undergraduate standing should be addressed to The Registrar, Cornell University; requests for the General Circular of Information (containing details regarding entrance requirements and other information for prospective students) should be addressed to The Secretary, Cornell University.

Correspondence regarding admission as a graduate student, and requests for copies of the Announcement of the Graduate School, should be sent to the Dean of the Graduate School, Cornell University.

Copies of the general announcement of the College of Agriculture, and of the forestry announcement, may be obtained from the Secretary, College of Agriculture.

Information regarding opportunities for self-support may be obtained from the Cornell University Christian Association and from the Secretary of the University.

Prospective forestry students who plan to enter as graduates, or as undergraduates with advanced standing, are urged to correspond with the Department of Forestry for general information regarding their work.

COURSES OF INSTRUCTION OFFERED BY THE DEPARTMENT OF FORESTRY

Courses intended primarily for students who do not expect to make forestry their major work

1. **The Farm Woodlot.** First term, credit two hours. Lectures, M, 9. Forestry Building 122. Practice, M or T, 2–4.30. Forestry Building 118. Professor MOODY.

The management of the farm woodlot, and the starting of new woodlots by planting or sowing. A course dealing with the woodlot as deserving and repaying proper care, such as is given other crops on the farm. Laboratory fee, 50 cents.

Students expecting to take courses 2 and 3 should not elect course 1, as the ground covered in course 1 is repeated in courses 2 and 3.

2. **Elements of Forestry: Mensuration, Utilization, and Management.** First term, credit three hours. Lectures, T Th, 9. Forestry Building 122. Practice, W or Th, 2–4.30. Forestry Building 118. Assistant Professor BENTLEY.

An elementary course including estimating and measuring the amount of standing timber and its value; measurement of logs and other forest products; rate of growth of timber in diameter, height, volume, and value; the best uses to which various forest products can be put; methods of logging, milling, and sale of timber; identification of common woods; age at which timber should be harvested; methods of regulating the amount of timber cut so as to insure a permanent income. (See course 3.) Laboratory fee, $1.

3. **Elements of Forestry: Silviculture.** Second term, credit three hours. Lectures, T Th, 9. Forestry Building 122. Practice, T or W, 2–4.30. Forestry Building 118. Professor SPRING.

An elementary course including the life history of the forest; the influence of soil and climate on forests; the influence of forests on stream flow, climate, and soil; forest planting, sowing, and nursery work; reproducing the forest without planting or sowing; care of the crop during its growth, including thinning; protection from fire and other enemies; identification of a few of the principal timber trees of this region. Laboratory fee, $1.

Courses 2 and 3 may be taken independently. If both courses are taken, they should meet the needs of students who wish a more detailed knowledge of timberland management than is given in course 1, but do not wish the professional courses.

Courses intended for both professional forestry students and students in other lines

6. **The Field of Forestry.** First term, credit two hours. Lectures, W F, 9. Forestry Building 122. Professor SPRING.

The place of forestry in the life of a nation; its aims and importance; national, state, communal, and private forestry enterprises; the day's work of a forester.

8. **Wood Technology.** Second term, credit two hours. (The entire course will be completed in the first ten weeks of the term, during which time there will be two lectures and one practice period each week.) Lectures, M W, 10. Forestry Building 122. Practice: professional forestry students, T, 2–4.30; other students, M, 2–4.30. Forestry Building 8. Professor RECKNAGEL.

Structure of wood; physical, chemical, and mechanical properties of wood; technical uses of wood (paper pulp, destructive distillates, and the like); wood conditioning (drying and seasoning); wood preservation. Laboratory fee, $1.

Courses intended primarily for professional forestry students

Professional forestry students should not elect courses 1, 2, and 3, as the following required professional courses cover the same ground in greater detail.

9. **Forest Utilization.** First term, credit four hours. Lectures, M T W Th, 10. Forestry Building 122. Field trip, one week (spring vacation), study of a lumbering operation in the Adirondacks or in northern Pennsylvania; cost not to

exceed $15. (The field trip is required of professional students, optional with others; credit for the course is given at the close of the first term.) Professor RECKNAGEL.

The principal industrial uses of timber; logging methods and equipment; logging in representative regions; manufacture of lumber; determination of stumpage values; timber sale contracts; timber sale administration, including marking, brush disposal, and scaling in practice; minor industries; utilization of forest products other than wood, as grazing range, fish and game, and the like.

10. **Forest Engineering.** Second term, credit two hours. Prerequisite plane trigonometry and one course in surveying. Lectures, T Th, 11. Forestry Building 122. Assistant Professor BENTLEY.

The construction of trails, roads, telephone lines, and the like. Field work in forest engineering is given in the field trip included in course 23.

11. **Forest Mensuration.** Second term, credit five hours. Lectures, M W, 8. Forestry Building 122. Practice, F, 8–1 and 2–4.30. Forestry Building 118. Assistant Professor BENTLEY.

Measurement of logs and standing timber; timber cruising; study of the rate of growth of timber; volume and yield tables. Laboratory fee, $1.50.

13. **Timber Trees and Forest Regions.** First term, credit three hours. Lectures, M W, 12. Forestry Building 122. Practice, F, 2–4.30. Forestry Building 118. Assistant Professor BENTLEY.

A brief account of the forest regions of the world; detailed description of the forest regions of the United States and Canada; the distribution, importance, and silvical characteristics of a large number of the leading timber trees of the United States and Canada, and the identification of such of these as do not grow near Ithaca. (The identification of trees growing near Ithaca is included in Botany 2.) Laboratory fee, $1.

14. **Silviculture: Forest Ecology.** First term, credit three hours. Prerequisite Botany 1 or its equivalent. Lectures, W F, 8. Forestry Building 122. Practice, W, 2–4.30. Forestry Building 8. Professor HOSMER.

The influence of site on the forest and of the forest on site; the behavior of trees as members of a forest community. Laboratory fee, 50 cents.

15. **Silviculture: Natural Reproduction and Care of the Forest.** Second term, credit three hours. Prerequisite courses 13 and 14. Lectures, T Th, 8. Forestry Building 122. Practice, Th, 2–4.30. Forestry Building 118. Professor HOSMER.

A technical discussion of the silvicultural systems as practiced in Europe, and the possibility of using them in each of the forest regions of the United States and Canada; improvement cuttings, thinning, and underplanting; marking timber for cutting. Laboratory fee, 50 cents.

16. **Silviculture: Forest Planting and the Forest Nursery.** Second term, credit three hours. Lectures, W, 9. Forestry Building 122. Practice, S, 8–1. Forestry Building 118. Professor SPRING.

Collection, care, and testing of tree seeds; identification of tree seeds and seedlings; raising trees in a forest nursery; starting forests by planting trees and by direct seeding; fixation of sand dunes; forestation on the prairies and under semi-arid conditions; great forestation enterprises of the world. Laboratory fee, $1.50.

18. **Forest Protection.** First term, credit one hour. Open only to professional forestry students. Lectures, Th, 11. Forestry Building 122. Professor SPRING.

Protection of forests from fire and other enemies. Protection from injury by insects and fungi is given in Entomology 41 and Plant Pathology 1 and 7, respectively.

19. **Forest Policy, Forest Law, and History of Forestry.** First term, credit three hours. Lectures, M T W, 11. Forestry Building 122. Professor SPRING.

The historical development and present status of the relations of state and individual to forestry; the elements of forest law.

20. **Forest Management.** First term, five hours. Open only to graduate students. Lectures, M T W Th, 9. Forestry Building 126. Practice, S, 9–11.30. Forestry Building 8. Professor RECKNAGEL.

Forest organization, including foundations of working plans, regulation of yields, and the formulating of working plans; forest finance, including forest valuation (the ascertainment of values) and forest statics (the comparison of values). Field work in forest management is given in the field trip included in course 23.

21. **Forest Administration.** Second term, credit two hours. (The entire course will be completed in the first ten weeks of the term, during which time there will be two lectures and one practice period each week.) Prerequisite course 20. Lectures, W Th, 9. Forestry Building 126. Practice, S, 9–11.30. Forestry Building 8. Professor RECKNAGEL.

Personnel and organization, exemplified by various actual organizations; business practice. Field work in forest administration is given in the field trip included in course 23.

22. **Seminary.** First and second terms, two hours a term. Open only to graduate students. Hours to be arranged. Forestry Building 126. Professors HOSMER, SPRING, RECKNAGEL, and MOODY, and Assistant Professor BENTLEY.

23. **Advanced Work.** First and second terms, credit two or more hours a term. Open to undergraduate and graduate students who have had the necessary training. Hours by appointment. Professors HOSMER, SPRING, RECKNAGEL, and MOODY, and Assistant Professor BENTLEY.

Individual advanced study of designated topics. During the six or eight weeks preceding Commencement, all graduate students taking course 23, except those who are specializing in lines not requiring a field trip, will be engaged in working-plan and other forestry work on a large forest tract in New York or Pennsylvania. The field trip will be in charge of Professor RECKNAGEL.

24. **Research.** First and second terms, three or more hours a term. Open only to graduate students who have had the necessary training. Hours by appointment. Professors HOSMER, SPRING, RECKNAGEL, and MOODY, and Assistant Professor BENTLEY.

COURSES OF INSTRUCTION GIVEN BY OTHER DEPARTMENTS AND LISTED IN THE RECOMMENDED SEQUENCE OF STUDIES

Biology

1. **General Biology.** First and second terms, credit three hours a term. Lectures, M W, 9, or T Th, 9. Roberts Hall 131. One practice period a week, T, Th, F, or S, 8–10.30, daily, 10.30–1, or daily except S, 2–4.30. Roberts Hall 302. Professors NEEDHAM and JOHANNSEN, and assistants.

This is an elementary course designed to acquaint the general student with the main ideas of biology through selected practical studies of the phenomena on which biological principles are based. Both lectures and laboratory work will deal with such topics as the interdependence of organisms, the simpler organisms, organization and phylogeny, heredity and variation, natural selection and adaptation, segregation and mutation, the life cycle, metamorphosis and regeneration, and the responsive life of organisms. Laboratory fee, $2.50 a term.

Botany

1. **General Botany.** First term, credit five hours. Lectures, M, 9 or 11. Dairy Building 222. Recitation, one hour, by appointment. Laboratory and field work, three periods of two and one-half hours each, by appointment. Students must consult the Department in regard to laboratory and recitation appointments before registering for the course. Professor WIEGAND, Doctor EAMES, Messrs. THOMAS, MACDANIELS, SHARP, METCALF, SEVERY, Mrs. WIEGAND, Miss HANCY, and others.

This course is designed to furnish a general knowledge of the fundamental facts and principles of plant life. The plant as a living organism will be considered

from the point of view of general structure, variability, adaptation, function of parts, life processes, evolution, and distribution. A part of the time will be spent in becoming acquainted with the commoner wild and cultivated species and with the larger natural groups of plants. As much field work as is practicable will be introduced. Laboratory fee, $4.

2. **Forest Botany.** First term, credit three hours. Prerequisite course 1 or its equivalent. Lectures or conferences, T, 8. Forestry Building 126. Laboratory or field work, T Th, 2–4.30. Agronomy Building, Botanical Laboratory. Doctor EAMES.

A course dealing with the identification of trees and shrubs, both in summer and in winter, and with other problems relating to forest plants. Adapted to all students wishing a technical knowledge of trees and shrubs. Laboratory fee, $2.50.

20. **General Plant Physiology.** First or second term, credit four hours. Prerequisite all freshman work or its equivalent, and course 1. This course may be taken to satisfy the requirement in physiology. Assistant Professor KNUDSON, and Messrs. ROBBINS, CURTIS, and NANZ. First term: Lectures, T, 10. Roberts Hall 292. Recitations, two sections, Th, 10. Roberts Hall 292, Agronomy Building 21. Laboratory: sec. I, T Th, 2–4.30; sec. II, W F, 2–4.30. Agronomy Building 21. Second term: Lectures, T, 10. Roberts Hall 292. Recitations, four sections, Th, 10. Roberts Hall 292, Agronomy Building 21, Agronomy Building 192, Home Economics Building 100. Laboratory: sec. I, M, 8–11, Th, 11–1; sec. II, M, 11–1, W, 10–1; sec. III, T Th, 2–4.30; sec. IV, W F, 2–4.30. Agronomy Building 21.

The topics include absorption, nutrition, relations to environment, growth, reproduction, and propagative processes. Laboratory fee, $5.

Chemistry

1. **Introductory Inorganic Chemistry.** Lectures, recitations, and laboratory. Repeated in second term, credit six hours.

1a. Lectures. First term: M W F, 11, Professor DENNIS and Mr. DAVIS; M W F, 12, Professor BROWNE and Mr. DAVIS. Second term: M W F, 11, M W F, 12, Professor BROWNE and Mr. DAVIS. Morse Hall, Lecture Room 1.

1b. Recitations (one hour a week to be arranged). Laboratory: First term, M F, 2–4.30; T Th, 2–4.30; W, 2–4.30, S, 8–10.30. Second term: M F, 2–4.30; T Th, 2–4.30; W, 2–4.30, S, 8–10.30; M W, 8.30–11. Professors DENNIS and BROWNE, Doctor WELSH, and Messrs. OVERMAN, GULICK, PARMELEE, WEISER, MACK, BENNETT, and HOVEY.

85. **Agricultural Chemistry.** First or second term, credit four hours. Prerequisite Chemistry 1. Lectures, T Th S, 11. Recitations: first term, T, 8, or Th or F, 9; second term, M, W, Th, or F, 8, T, 10, or F, 9. Morse Hall, Lecture Room 1. Professor CAVANAUGH, and Messrs. RICE and CONLIN.

A general course treating of the relations of chemistry to agriculture and dealing with the composition and chemical properties of plants, soils, fertilizers, feeding-stuffs, insecticides, and fungicides.

Civil Engineering

10. **Elementary Surveying.** Freshmen. First term, credit three hours. One recitation and two field or computation periods a week. Eight sections. Assistant Professor LELAND, and Messrs. LAWRENCE, MCCURDY, BAKER, and TEETER.

Use of steel tape, level, and transit. Fundamental surveying methods. Measurement of lines, angles, and differences of elevation. Land surveying; areas and plotting. Recitations, field work, computations, and mapping. Textbooks: Breed and Hosmer's Elementary Surveying, and Leland and Boothroyd's Area of Land.

11a. **Advanced Surveying.** Primarily for students in forestry and landscape art. Second term, credit four hours. Prerequisite course 10. Four periods a week; field work after Easter. Assistant Professor LELAND and Mr. LAWRENCE.

Topographic, hydrographic, and geodetic surveying and field astronomy. United States Public Land Surveys. Precise measurements. Transit and stadia; plane table; sextant. Stream measurement. Topographic reconnaissance. Road location; circular curves. Triangulation for the control of local surveys; base lines. Field determinations of time, latitude, and azimuth. Recitations, field work, and plotting. Textbooks: Breed and Hosmer's Higher Surveying, and Campbell's Practical Astronomy.

13. **Summer Survey: Topographic, Hydrographic, and Geodetic Survey; Camp.** Sophomores. Six weeks in June and July; credit six hours. Date of beginning to be announced in second term. Prerequisite course 11. Open also to students in forestry who have had course 11a, for whom the work is modified to meet their special needs. Field and office work six days and evenings a week. Assistant Professors LELAND, UNDERWOOD, TURNER, WALKER, and GEORGE, and Messrs. LAWRENCE, MCCURDY, BAKER, TEETER, ———, and ———.

Practical experience in surveying under field conditions. An extensive topographic survey with the transit and stadia and the plane table, and a hydrographic survey of a portion of Cayuga Lake, are executed, and field maps are made. Triangulation and precise leveling control the topographic and hydrographic work. A base line is measured with invar tapes. Astronomic observations for azimuth, latitude, and time are made, and results computed. Each party also performs a number of field exercises in city surveying. Each student takes part in all branches of the work.

14. **Survey Computations and Mapping.** Juniors. First term, credit four hours. Prerequisite course 13. Six sections. Assistant Professors LELAND and UNDERWOOD, and Messrs. LAWRENCE and ———.

Adjustment of observations by the method of least squares. A complete set of the computations covering the field work of the previous summer survey, course 13, embracing base-line measurement, triangulation, and trigonometric and precise leveling. The work results in a set of permanent records, with the geographic positions, azimuths, distances, and elevations of the various triangulation stations. The actual construction of final topographic maps of the area embraced in the preceding summer survey. The field sheets are combined for this purpose, reduced in scale from 1:4,800 to 1:12,000, and reproduced, using the triangulation system as a basis for the work. Recitations, computations, and mapping. Textbook: Crandall's Geodesy and Least Squares.

Drawing

1. **Mechanical Drawing.** First or second term, credit three hours. Students must register for not less than three hours. Lectures during practice. Practice, M W, 2–4.30, or T Th, 2–4.30. Two remaining two-hour practice periods by appointment. Dairy Building 341. Mr. REYNA.

Since the drafting-room will accommodate but thirty students in each section, those registering in the course will be assigned to desks in the order of registration in the Department. Therefore, in order to secure a place it will be necessary to report promptly to the Department. A small amount of outside reading may be required.

English

1. **English, Introductory Course.** First and second terms, credit four hours a term. Students who have not taken the course in the first term may enter in the second term in sections provided for them. Open only to underclassmen who have satisfied the entrance requirement in English. Freshmen who are candidates for the degree of Bachelor of Arts will ordinarily take course 3, and may not enroll in course 1 except with the consent of the head of the Department. Twenty-five sections at the following hours: T W Th F, 8, 9, 10, 11, 12. Rooms to be announced. Assistant Professors ADAMS and MONROE, Doctors BAILEY, BROUGHTON, GILBERT, and JENSEN, and Messrs. BALDWIN, CROWELL, TOWNLEY, HEBEL, and BOULTER.

A study of representative works in English literature, including four plays of Shakespeare, four modern novels, selected essays, and poems of Milton, Tennyson, and Browning. Practice in composition in connection with the reading, with incidental study of the principles of writing. Registration in the course is in charge of Doctor Bailey.

Students who elect English 1 must apply at Goldwin Smith A on Monday, Tuesday, or Wednesday of registration week for assignment to sections.

Entomology

3. **General Entomology.** First and second terms, repeated third term, credit three hours a term. Prerequisite course 1 or Zoology 1. First and second terms: Lectures, W F, 9. First term, Dairy Building 222; second term, Roberts Hall 392. Professor HERRICK. Practical exercises, W, Th, or F, 2–4.30, or S, 8–10.30. Roberts Hall 392. Professor HERRICK, Miss STRYKE, and Mr. HAWLEY. Third term: Lectures, daily except S, 8, July 7 to August 15. Roberts Hall 392. Miss STRYKE. Practical exercises, two afternoons by appointment, July 7 to August 15. Miss STRYKE and Mr. ———.

First term, lectures on the characteristics of orders, suborders, and the more important families, and on the habits of representative species. The practical exercises include a study of the structure of insects and practice in their classification. The lectures only (credit two hours) are taken by those who have had courses 4 and 5. The work of the first term may be taken without registration for the second term. It is repeated in the third term. Laboratory fee, $3.

Second term, lectures on the more important insect pests and on methods of controlling them. The practical exercises will include a study of the different stages of as many of the forms as time will permit, together with observations in the field on the habits of the pests. Prerequisite first term of this course. Laboratory fee, $3.

Third term, the work will cover essentially the same ground as that of the first term. When possible, the laboratory work will utilize materials collected by the student in the field. Laboratory fee, $1.50.

41. **Forest Insects.** Second term, credit two hours. Prerequisite first term of course 3. Lectures, T Th, 11. Roberts Hall 392. Professor HERRICK.

A course of lectures dealing with insects injurious to forest and shade trees, together with a consideration of the best methods of controlling their ravages.

51. **Aquiculture.** Second term, credit two hours. Lectures, M W, 12. Roberts Hall 392. Assistant Professor EMBODY.

A course on the conservation and utilization of the resources of inland waters.

The Farm

1. **The Farm.** First, second, or third term, credit two hours. Field work and recitations, by appointment. One practice period a week, daily, 8–10.30 or 10.30–1, or daily except S, 2–4.30, at appointed places on the farm. Professor NEEDHAM, Assistant Professors COMSTOCK and EMBODY, Mr. ALEXANDER, and assistants.

This is a course in the study of our agricultural environment. The university farm will be explored. Its topography, its population, and its chief crops, wild and cultivated, will be studied. Its fields, hills, woods, and streams will be explored, and records will be made of the things observed.

The course deals with the sources of agriculture. It considers crops from the naturalist's viewpoint—Nature's cereals and fruits and roots and fowls that were all present before agriculture developed. Wild products will be compared with cultivated varieties, and the related forms that have not been brought into cultivation will not be overlooked. Finally, these things will be viewed collectively, as conditioning the human affairs of the country community. They will be considered as elements that may be contributory to the beauty, the healthfulness, and the intellectual interest and enjoyment of the farm home. Fee, $2.

Geology

1. **Dynamic Geology.** First term, credit three hours. Lectures, T Th, 11; repeated second term, T Th, 9. Sibley Dome. One laboratory period a week, sections M T W Th F. One all-day excursion required. Professor RIES, and Messrs. MONETT, HOOK, and ———.

Planned to give beginners a knowledge of the fundamental principles and facts of dynamic geology by means of lectures, maps, lantern slides, specimens, and textbook and field study. For those who desire to continue in geology this course may be followed in the second term by the elementary course 2, 11, or 21.

11. **Elementary Mineralogy.** First term, credit three hours; if taken after course 12, credit two hours. Lectures, M W, 8. McGraw Hall, Geological Lecture Room. Laboratory sections to be arranged. Professor GILL and Mr. VANDERMEULEN.

For beginners who desire a general knowledge of the commonest minerals and their uses, the properties by which they are recognized, and their significance as constituents of the earth's crust, or as sources of useful substances.

15. **General Lithology.** Second term, credit one hour. Prerequisite courses 1 and 11. Lectures or recitations, alternate S, 9; laboratory, alternate W, 2–5.30. McGraw Hall, Mineralogical Laboratory. Professor GILL.

An elementary course designed to teach recognition of the various kinds of rocks, their mineral composition, mode of origin, and so forth.

Landscape Art

2. **Lectures Introductory to Work in Landscape Art.** Second term, credit one hour. Lectures, W, 10. Assistant Professor DAVIS.

A general course introductory to an appreciation of the landscape.

Mathematics

1. **Solid Geometry.** First or second term, credit three hours. T Th S, 11.

Open to all students, but designed especially for those who have entered with the minor requirements in mathematics and are preparing: (a) to teach mathematics in the secondary schools; (b) to take up engineering work later in the course; (c) to specialize in chemistry or physics.

3. **Plane Trigonometry.** First or second term, credit three hours. M W F, 11.

Open to all students, but designed especially for those mentioned under course 1.

Meteorology

1. **Meteorology and Climatology.** Second term, credit three hours. Lectures, M W F, 10. Roberts Hall 131. Professor WILFORD M. WILSON.

Lectures and weather observations. Designed to acquaint the student with the general circulation of the atmosphere; development, movement, and conditions that attend cyclones, tornadoes, and special storms; practical weather forecasting from weather maps and local observations; the use of meteorological instruments; general and special climatology and its relation to agriculture.

Physics

2. **Introductory Experimental Physics.** First or second term, credit five hours. Three lectures and two classroom periods each week. Lectures: T Th S, 9; M W F, 11. Rockefeller A. Professors NICHOLS, MERRITT, and SHEARER, and Assistant Professor GIBBS. Classroom work: Assistant Professor GIBBS, and Messrs. BUCKLEY, HOWES, MALLORY, RODGERS, SWISHER, THOMPSON, and WEEKS. Hours to be assigned. Required of candidates for B. Chem., C.E., and B.S.

A general survey of the animal phyla, the life processes, adaptations, and relationships of animals, the principles of zoology, and an introduction to morphology and development. As far as possible each phase of the subject will be illustrated with living material.

Plant Pathology

1. **Plant Pathology.** First or third term, credit three or four hours. Prerequisite Botany 1 or its equivalent. First term: Lectures, W, 12. Bailey Hall. Recitations, F, 12, by sections as follows: graduate, Home Economics Building 100; general agriculture, Agronomy Building 192; pomology, Roberts Hall 292; olericulture, Bailey Hall, Basement; forestry, Forestry Building 126. Practice by limited sections of twenty-five students as follows: graduate, W F, 2–4.30; general agriculture, W F, 2–4.30; pomology, Th, 2–4.30, S, 10.30–1; olericulture, Th, 2–4.30, S, 10.30–1; forestry, T Th, 10–12.30. Bailey Hall, West Basement. (If registration warrants, additional practice sections in pomology and in general agriculture will be offered: recitations, Th, 12; practice, M T, 2–4.30.) Third term: Lectures, W, 12. Bailey Hall. Recitations, F, 12. Bailey Hall, West Basement. Practice, W F, 2–4.30. Bailey Hall, West Basement. (If registration warrants, an additional practice section will be offered: recitations, hour to be arranged; practice, Th, 2–4.30, S, 8–10.30.) Students registering for three hours omit the lectures. Professor WHETZEL, Assistant Professors GREGORY, HESLER, and RANKIN, and Messrs. CHUPP, WEIMER, and KEEFER.

A fundamental course treating of the common diseases of cultivated crops, their nature, cause, and control. A prerequisite for all other courses in plant pathology. Students specializing in those lines indicated by the names of the sections will be expected to schedule this work accordingly. The practice work must be taken in the couplets announced above. Laboratory fee, $4.50; breakage deposit, $2.

7. **Principles of the Control of Tree Diseases.** Second term, credit two hours. Prerequisite course 1. Lectures, F, 12. Forestry Building 210. Practice, Th, 10–12.30. Bailey Hall, West Basement. Assistant Professor RANKIN and Mr. KEEFER.

Political Science

51. **Elementary Economics.** First and second terms, credit three hours a term. One lecture and two recitations each week. Lectures: Barnes Auditorium, M, 9; repeated M, 11; Assistant Professor BAUER. Recitations, T Th, 8, 9, 10, 11, 12. Assistant Professors BLAKEY and USHER, Doctor SMITH, and Mr. GILMAN.

An introduction to economics, including a survey of business organization and corporation finance; principles of value, money, banking, and prices; international trade; free trade and protection; wages and labor conditions; the control of railroads and trusts; socialism; principles and problems of taxation. Section assignments are made at the first lecture.

Rural Engineering

3. **Farm Mechanics.** First, second, or third term, credit three hours. Students are urged to take Drawing 1 in preparation for this course. First and second terms: Lectures, T Th, 10. Dairy Building 222. Practice, M, T, or W, 2–4.30. Rural Engineering Building. Professor H. W. RILEY and assistants. Third term: Lectures, W F, 8. Roberts Hall 292. Practice, F, 2–4.30. Rural Engineering Building. Mr. HAZEN.

A study of the principles of operation, the details of construction, and the practical operation and care of: A—Machinery, including gasoline engines, water wheels, devices for transmitting power, hydraulic rams, pumps, spray nozzles, spraying outfits, water-supply outfits. B—Implements, including plows and binder attachments, with a discussion of the special mechanical features of some of these implements now on the market. Laboratory fee, $2.

Forge Work. (A non-agricultural elective. Sibley course S4.) Freshmen. First or second term, credit one hour. Three hours of work a week. Forging, welding, tool dressing, tempering, etc., together with demonstrations in the production of drop forgings. Daily, 8–11, 11–2, 2–5, as assigned. Messrs. HEAD and BROOKS.

Soil Technology

1. **Principles of Soil Management.** First, second, or third term, credit three hours. Prerequisite Chemistry 1 and Geology 1. Lectures, T Th, 9. Dairy Building 222. One laboratory period a week, daily, 2–4.30. Agronomy Building 42. Students must consult members of the departmental staff before choosing laboratory period. First term, Professor BIZZELL; second and third terms, Assistant Professor BUCKMAN.

A comprehensive course dealing with the origin, composition, and properties of soils, with particular reference to their management in crop production. The laboratories will consist in practice designed to demonstrate fundamental physical relations, and will be supplemented by laboratory lectures. Laboratory deposit, $3.

Zoology

5. **Systematic Vertebrate Zoology and Ecology.** First and second terms, credit three hours a term. Lectures, M, 8, McGraw Hall 5. Laboratory: sec. 1, M W, 2–4.30; sec. 2, T Th, 2–4.30. McGraw Hall 7. Assistant Professor REED, Doctor WRIGHT, and Mr. HARPER.

Lectures on the natural history of vertebrates, dealing with such topics as the principles of classification and nomenclature; characters and relationships of groups; the habits, life histories, principles of coloration, and economic value of the common species. Laboratory study of representative forms with special reference to the parts employed in classification, and with a view to practical identification. Field work is given during the fall and spring.

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OFFICIAL PUBLICATIONS OF CORNELL UNIVERSITY

Issued at Ithaca, New York, monthly from July to November inclusive, and semi-monthly from December to June inclusive.

[Entered as second class matter August 31, 1910, at the post office at Ithaca, New York, under the Act of July 16, 1894.]

These publications include

Catalogue Number (containing list of officers and students), price 25 cents,

Book of Views, price 25 cents,

Directory of Faculty and Students, Second Term, 1913–14, price 10 cents,

and the following informational publications, any one of which will be sent gratis and post-free on request. The date of the last edition of each publication is given after the title.

General Circular of Information for prospective students, February 1, 1914.

Announcement of the College of Arts and Sciences, May 1, 1914.

Announcement of Sibley College of Mechanical Engineering and the Mechanic Arts, January 1, 1914.

Announcement of the College of Civil Engineering, February 15, 1914.

Announcement of the College of Law, July 1, 1914.

Announcement of the College of Architecture, May 15, 1914.

Announcement of the New York State College of Agriculture, June 1, 1914.

Announcement of the Winter Courses in the College of Agriculture, June 15, 1914.

Announcement of the Department of Forestry, August 1, 1914.

Announcement of the Summer Term in Agriculture, April 15, 1914.

Announcement of the New York State Veterinary College, April 1, 1914.

Announcement of the Graduate School, January 15, 1914.

Announcement of the Summer Session, March 15, 1914.

Annual Report of the President, November 1, 1913.

Pamphlets on scholarships, fellowships, and prizes, samples of entrance and scholarship examination papers, special departmental announcements, etc.

Announcement of the Medical College may be procured by writing to the Cornell University Medical College, Ithaca, New York.

Correspondence concerning the publications of the University should be addressed to

The Secretary of Cornell University,
Ithaca, New York.